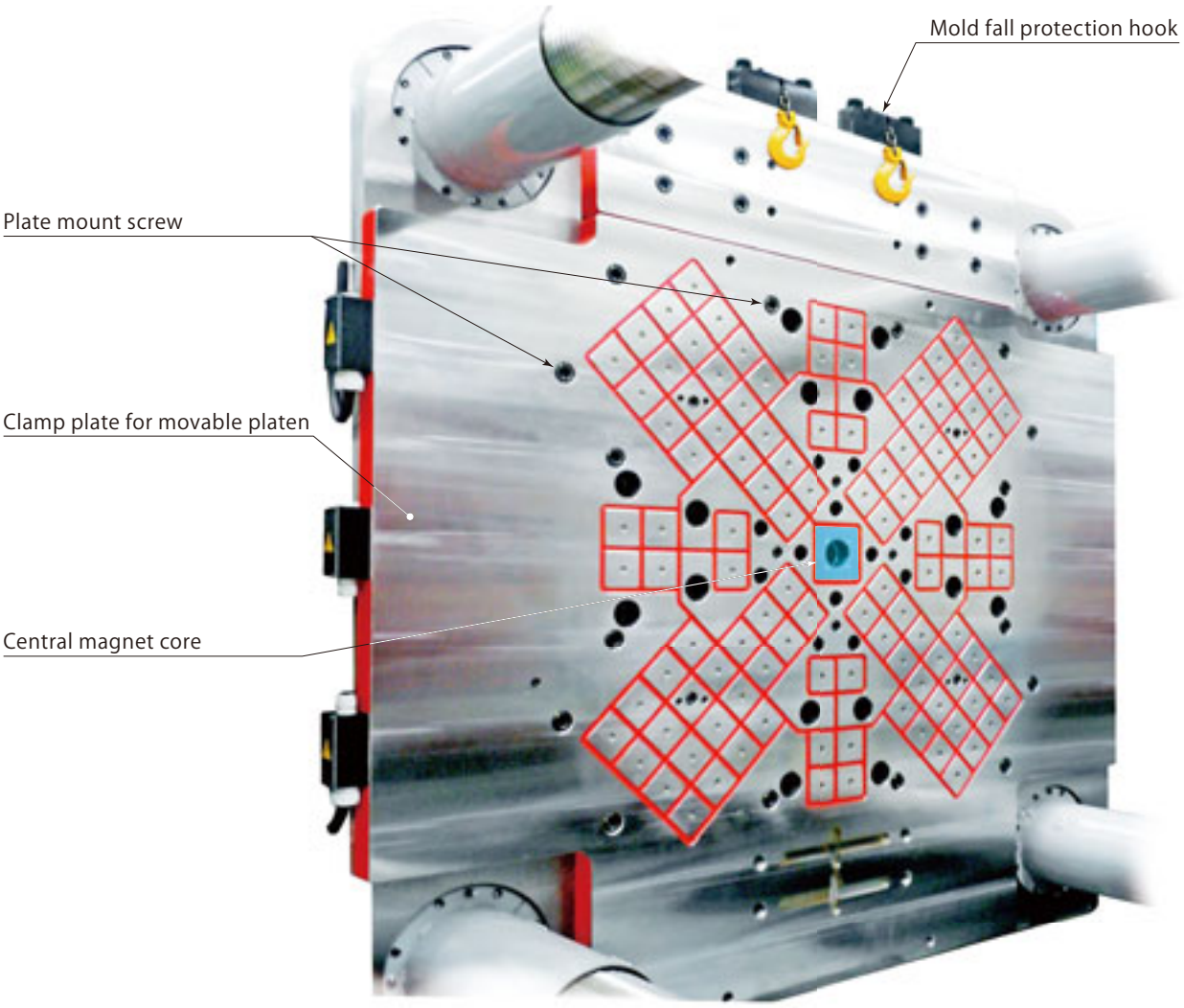
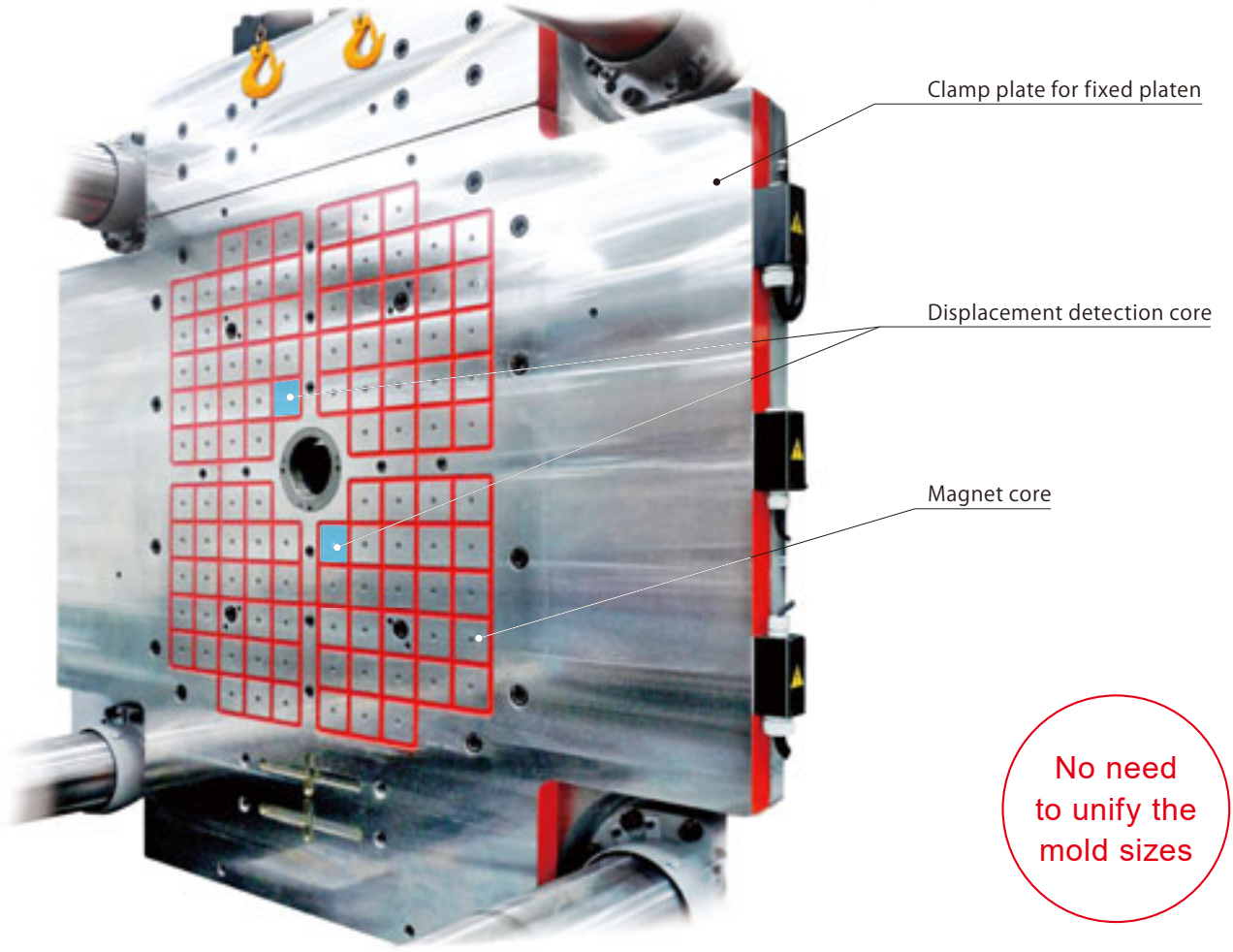


Clamp molds instantly with super

Pascal mag clamp is a mold clamp system for injection molding
The clamp plate is one set of two plates for movable platen and



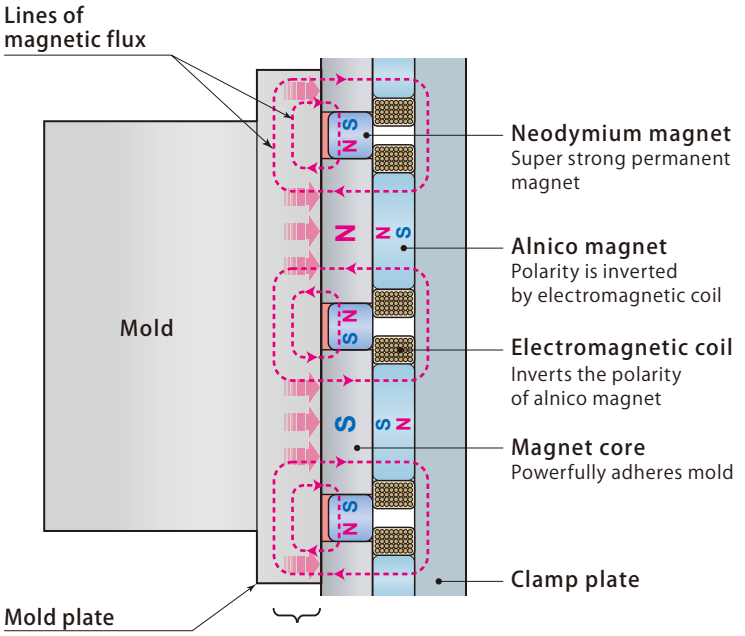
No need to unify the mold sizes

Clamping mold instantly (0.5-4.5 sec)

strong permanent magnet !

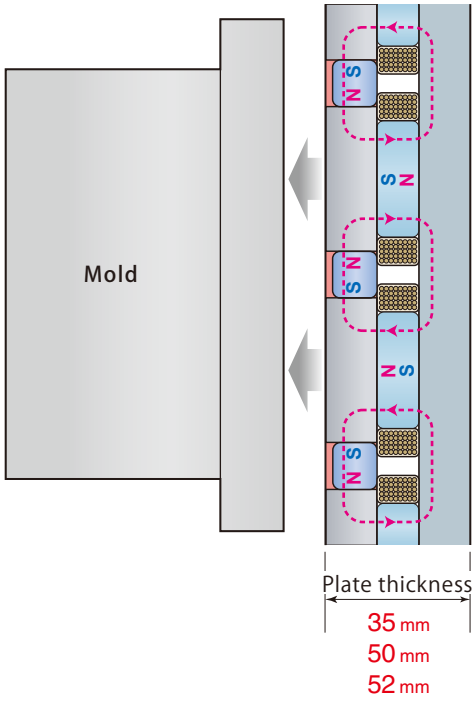
machines that clamps the mold with powerful magnet force.
fixed platen sides.

Clamp (Magnetized)



1. Electromagnetic coil is energized for **0.5** sec.
2. Polarity of alnico magnet is inverted.
3. Neodymium magnet and alnico magnet become homopolar.
4. Magnet core becomes a strong magnet to clamp the mold.

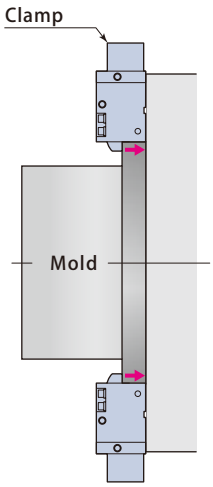
Unclamp (Demagnetized)



1. Electromagnetic coil is energized for **0.5** sec.
2. Polarity of alnico magnet is inverted.
3. Magnetic flux of neodymium magnet and alnico magnet is not emitted from the surface of the magnet core so that the mold can be unclamped.

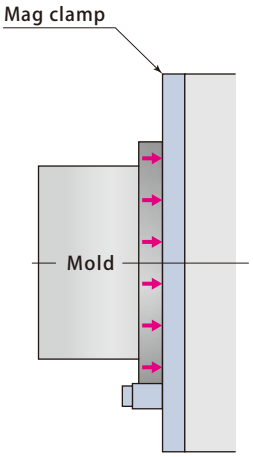
- Mold can be adhered and detached instantly (0.5-4.5 seconds).
- Energization required only when switching on and off. No energization required during clamped condition. No electricity consumed, thus no heat generation.
- Once the mold is clamped, unclamping (demagnetization) will not occur even when a power failure or power cable breakage occer.
- Magnetic force of permanent magnet will not decrease through aging. Clamping force is maintained for long-term use.
- Clamp plate has no moving parts, thus assuring high durability. Plate interior is maintenance-free.
- Clamp force is evenly applied on all faces of the magnet core. No gaps are created between the machine's platen surface and center part of the mold which helps improve molding accuracy.

Conventional



Only the edge is clamped.

Mag clamp

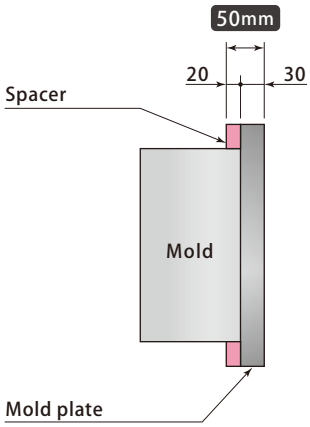


The entire surface is absorbed.

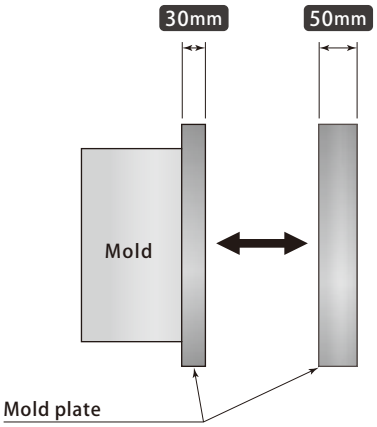
- No need to unify the mold sizes. (Note that clamping force is dependent on the size of mold plate.)

Vertical

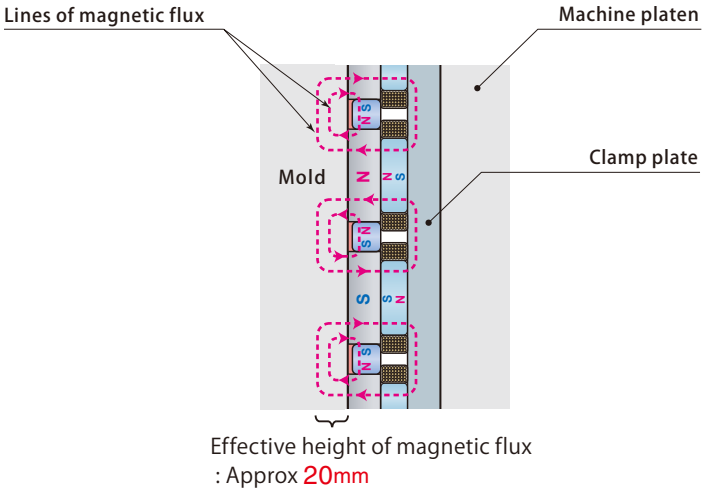
No need to attach a spacer



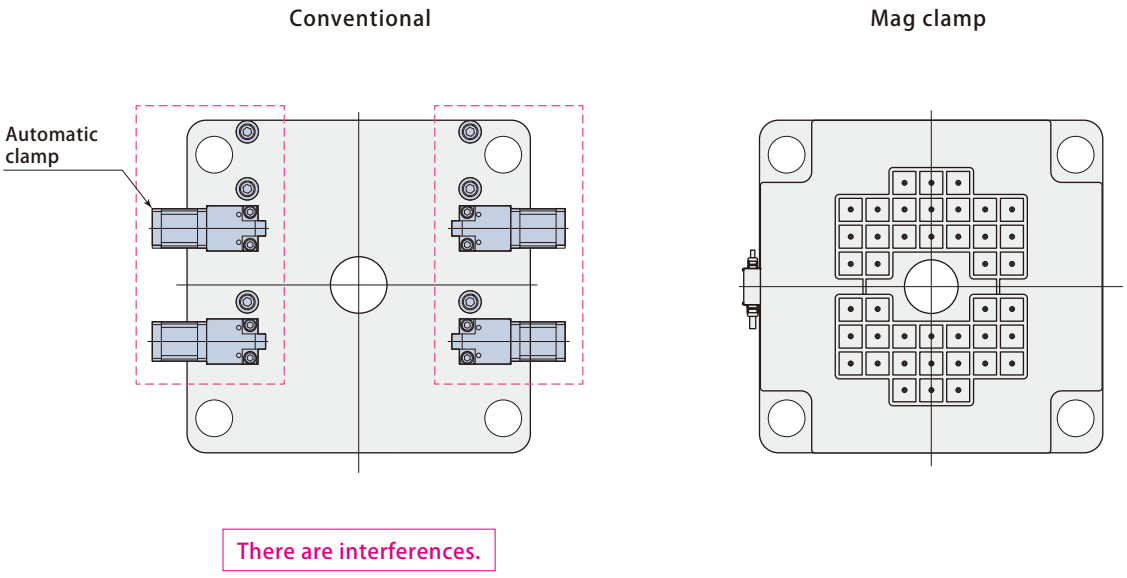
No need to remake a mold plate



- The effective height of magnetic flux is about 20 mm above clamp plate surface. Magnetic field does not cause significant effect inside the mold.
- No magnetic field is generated from the sides or back of the clamp plate. So the injection nozzle and controller are not affected.



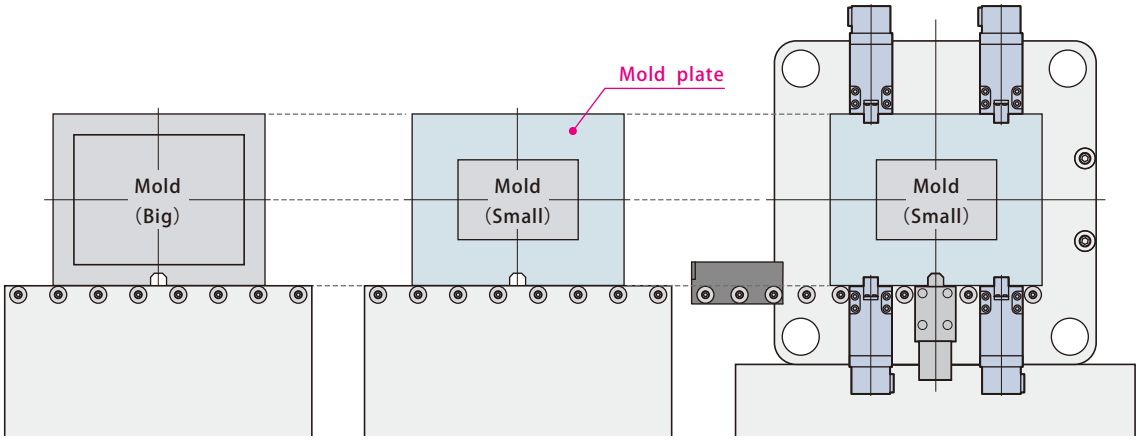
- The mounting space for other retrofittable clamp is not required, and machine platen surface can be maximized for the mold.



● Even if the mold height is not unified, the horizontal loading is feasible by simply adjusting the load level.

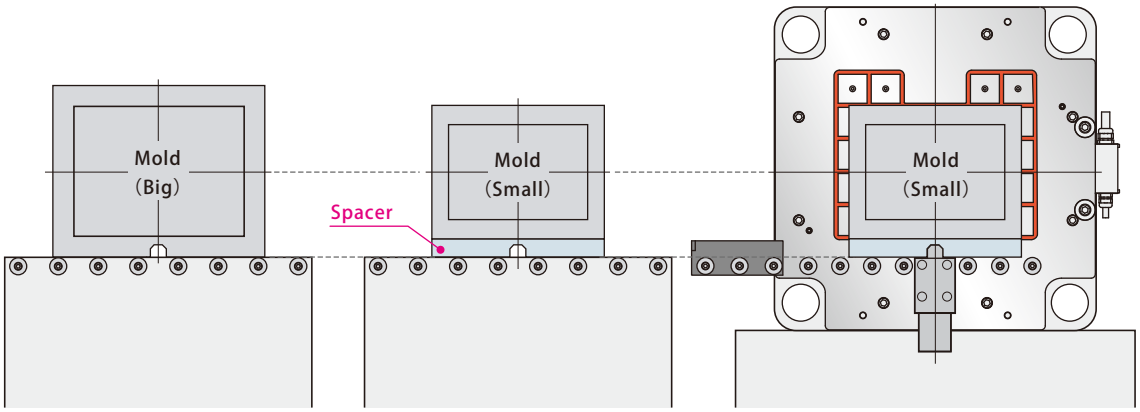
Horizontal

Conventional



The reproduction of mold plate is required.

Mag clamp



Only a spacer is added.

Model designation

	Loading direction	Clamp plate size	Clamp plate thickness	DD mag clamp		Diameter of locate ring (mm)	Power voltage	Language on operation panel	Operating temperature	Surface treatment	Special specification
MG	A : Vertical loading B : Horizontal loading	0020 ~ 3000	⁄ : Standard S : Thin-model	⁄ : Not include X : Include	–	1 : ø40 2 : ø60 3 : ø100 4 : ø120 5 : ø150 6 : ø180 7 : ø250 9 : Special	2 : 200/220V 3 : 380V 4 : 440V 5 : 480V	J : Japanese E : English C : Chinese	⁄ : 0~80℃ H : 0~150℃ U : 0~180℃	⁄ : Not include N : Rust proof G : Surface polish	⁄ : Standard Attached : Special ＊ Layout drawing No. comes

Example : MG A 0020 S - 2 2 J H N

Specifications

Model			MG□
Clamping force (per one magnet core)	Thin-model	32×100mm	3.43kN
		50× 50mm	2.45kN
		100×100mm	7.84kN
	Standard	70× 70mm	7.35kN
		75× 75mm	7.84kN
		115×115mm	15.68kN
Operating temperature ℃			0 ～ 80 (0 ～ 150 or 0 ～ 180 for heat proof type)
Magnetic flux height mm			20 (mold plate material SS400)
Power supply voltage			AC200 / 220V ±5% (50/60Hz)
Applicable machine			For general injection molding machine
Plate mounting method			Bolting with the tap holes of machine platens
Displacement detection system (movable side & fixed side)			Include

- Additional tap holes are required in the middle of machine platens.
- Operating temperature indicates the temperature on the surface of the clamp plate.

Accessories

- Locate ring (fixed side only)
- Mold fall protection block (movable side only)
- Operation panel model ESMD
- Control box model EMGD
- Control cables
- Interlock

Option

- Non standard voltage arrangement (50/60Hz)
  - AC380V ±5%
  - AC440V ±5%
  - AC480V ±5%
- High temperature
  - 0 ～ 150℃
  - 0 ～ 180℃
- Rust proof, polish arrangement for clamp plate
- Mold fall protection hook model MGR (movable side & fixed side)
- Additional magnet core
- Special core layout
- Horizontal loading arrangement
- DD mag clamp

Clamp plate									Mold fall protection hook			
Model	Clamping force of IMM (kN)	Clamping force ＊1 (kN)		Thickness (mm)	Weight (kg)		Voltage capacity ＊3 (kVA)	Min. mold size ＊4 (mm)	Model	Eye bolt on mold		Max. allowable load per hook (ton)
		Movable side	Fixed side		Movable side	Fixed side				Size ＊5	Q'ty	
MGA0020S	200	22	22	35 (Thin-model) ＊2	32	32	15	130	MGR061	M12 ～ M24	2 ＊6	0.4
MGA0030S	300 ～ 350	34	29		39	38		200				
MGA0050S	400 ～ 550	41	39		50	50	30	215				
MGA0055S	400 ～ 550	41	39		49	48		225				
MGA0060S	600	41	39		45	44		240				
MGA0080S	750 ～ 800	55	69		61	60	40	290	MGR062			
MGA0100S	1000 ～ 1100	78	78		83	82		300				
MGA0130S	1200 ～ 1300	110	103		96	95		330				
MGA0150S	1400 ～ 1500	123	118		123	120		370	MGR063			1.7
MGA0050	500 ～ 600	59	59	50	72	69	15	240	MGR062			0.4
MGA0080	750 ～ 850	88	88		91	88		260				
MGA0100	1000 ～ 1200	118	88		122	119	30	280				
MGA0130	1300	118	118		140	138		280				
MGA0140	1300	133	118		138	138		310				
MGA0150	1400 ～ 1600	147	147		177	179		310	MGR063			1.7
MGA0160	1400 ～ 1600	192	147		189	190		370				
MGA0180	1700 ～ 1800	176	176		201	197		330				
MGA0190	1700 ～ 1800	192	176		201	201		370				
MGA0230	2200 ～ 2300	221	206		236	238	40	400				
MGA0250	2500 ～ 2600	251	235		269	270		420				
MGA0280	2800 ～ 3000	251	265		292	294		440				
MGA0350	3500 ～ 3600	310	314		350	361		475	MGR081	M16 ～ M30		3.03
MGA0450	4500	398	408	52	473	478		565	MGR101	M20 ～ M42		4.8
MGA0550	5500	427	439		535	540		570				
MGA0650	6500	545	533		654	669	45	635				
MGA0850	8500	633	690		823	839		710			4 ＊6	
MGA1050	10000 ～ 10500	809	815		1036	1049		790				
MGA1300	13000	927	1004		1155	1177		855				
MGA1600	14000 ～ 16000	1176	1160		1434	1428	80	970	MGR131	M24 ～ M48		8.04
MGA2000	18000 ～ 20000	1264	1317		1964	1958		1000	MGR161	M36 ～ M64		12.06
MGA2500	22000 ～ 25000	1558	1505		1964	1958	100	1065				
MGA3000	28000 ～ 30000	1793	1788		2262	2260		1140				

＊1 : Total clamping force per clamp plate with the condition that the mold plate is contacting all the magnet cores.

＊2 : Suitable for the small size of injection molding machine with small daylight.

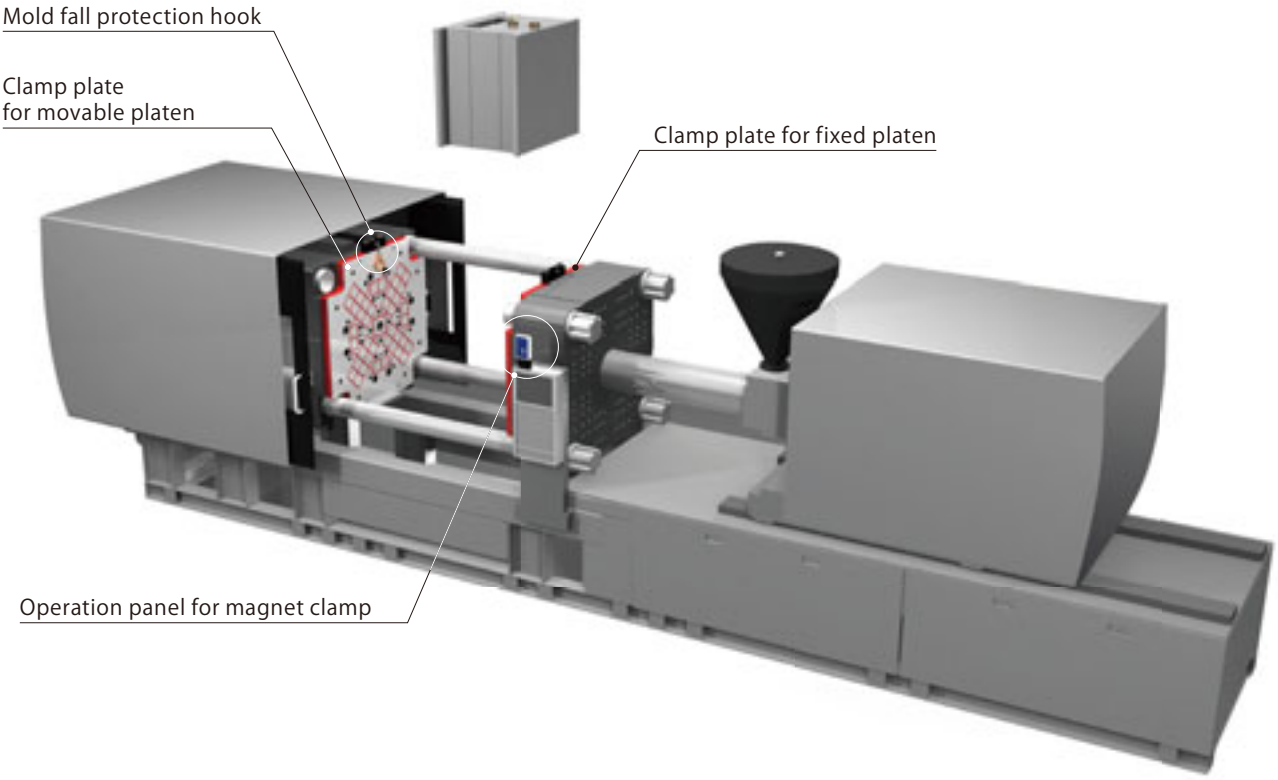
＊3 : The value indicates kVA at 200/220V AC. Contact Pascal for details in case the voltage is 380, 440 and 480V AC.

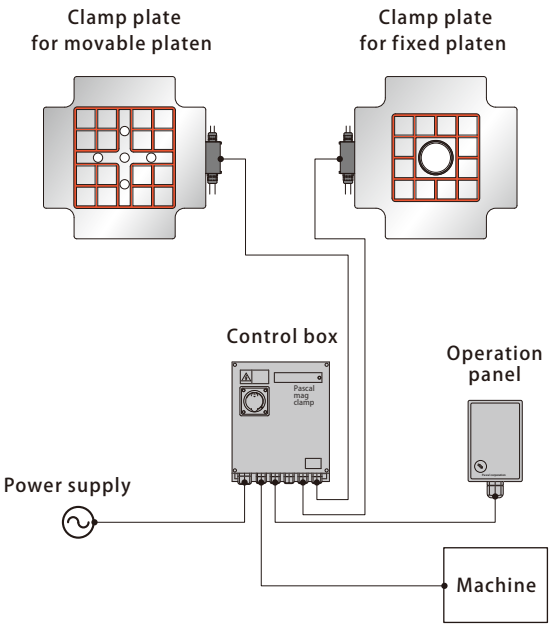
＊4 : It is reference value in case of the production under the general condition. It is not the value guaranteed.

＊5 : The size of eye bolt on the mold is determined according to the size of the hook. Make sure that allowable load of eye bolt is greater than the mold weight.

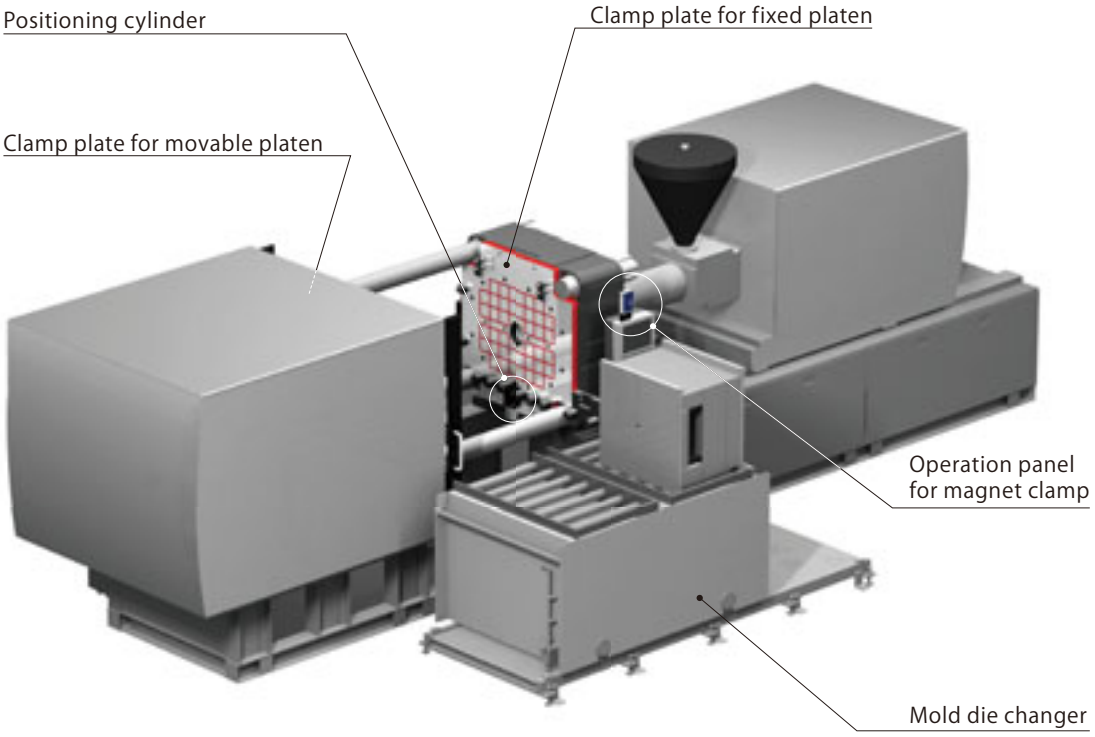
＊6 : The number of eye bolts on mold side indicates one per mold (movable side & fixed side).

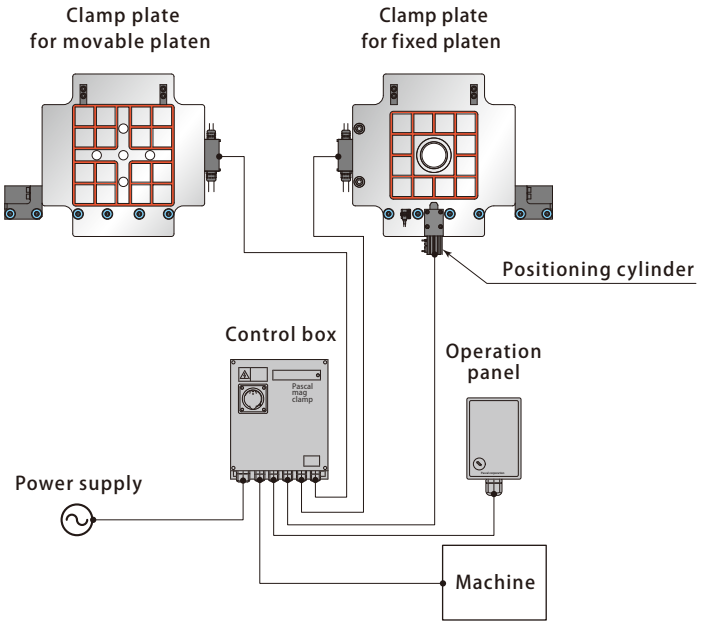
Vertical loading





Horizontal loading





Operation panel

Compact and user-friendly operation panel exclusively designed for magnetic clamp.
It is mountable on IMM or wall of IMM utilizing the tap holes at the rear side. (M4 bolts x 4 accessories)

[For vertical loading]

model **ESMD-A**

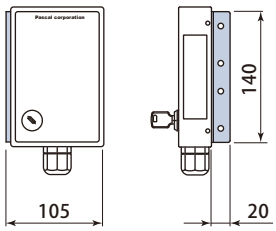
[For horizontal loading]

model **ESMD-B**

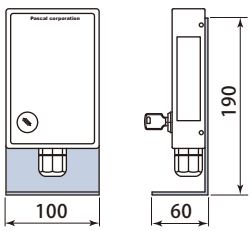
Model		ESMD-A	ESMD-B
Loading direction		Vertical loading	Horizontal loading
Weight	kg	0.6	0.6

Mounting bracket

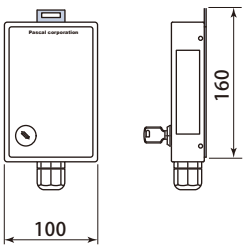
L type



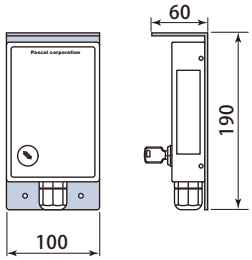
Self-standing type



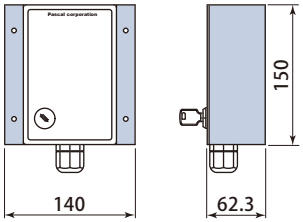
Wall mount type



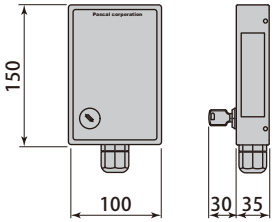
Hang down type



Embedded type

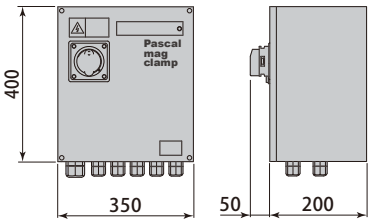


Operation panel dimensions



Control box

model **EMGD**

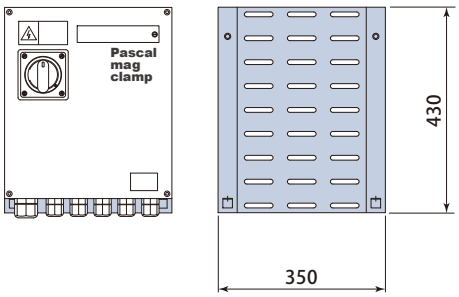


＊Size for model EMGD-A2J2

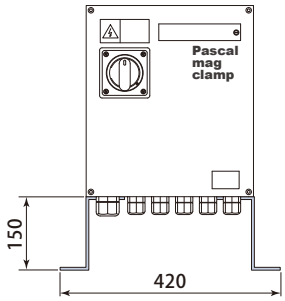
Model		EMGD
Weight	kg	25 ～ 80

Mounting bracket

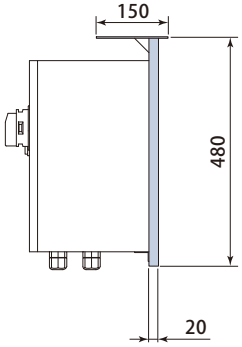
Wall mount type



Self-standing type



Hang down type



Interlock

Safety interlocks listed below are built in the electric control circuit for mold change operation.

- When changing a mold, Mag clamp operation is feasible only when the following conditions are prepared.

  Mag clamp ：①Mold change mode

  Molding machine ：②Set-up（or manual）mode ③Nozzle retracted ④Ejector retracted ⑤Platen closed-end ⑥Safety door closed

  Conditions ②,③ and ⑤ on molding machine can be checked by LED on the operation panel.

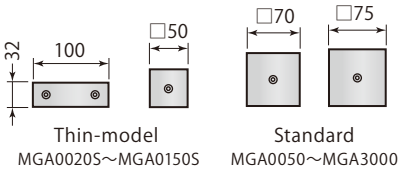
- During automatic operation

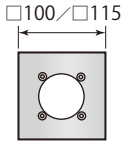
  If the mold is displaced or detached from the clamp plate, the molding machine is immediately stopped by the displacement detection function.

Mag clamp can clamp the mold strongly optimizing the magnet core layout.

Adopting 4 different size and shape of magnet core, Pascal ideally layouts the core on the clamp plate according to the machine platen size specifically providing the core at the center of the plate so that the plate can rigidly hold the mold.

In order to secure strong and stable clamp force for even a small size of mold, in some models, large size of core is provided at the center of the plate on movable platen. **PAT.**



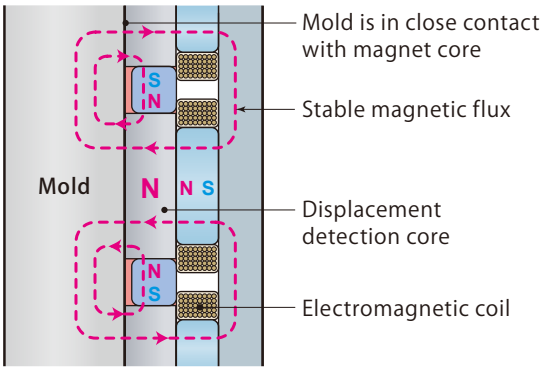


＊Center magnet core is available for model MGA0020S, MGA0140, MGA0160 and MGA0190～MGA1300.

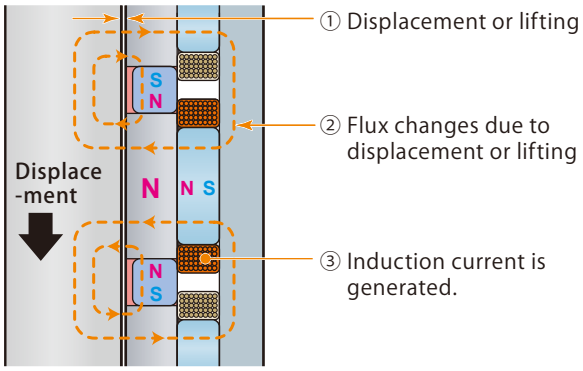
Displacement detection system (standard) PAT.

Displacement or lifting of the mold can be detected by the electromagnetic coils being built in the magnet core located near the center of clamp plates.
When the mold moves, these electromagnetic coils detect an induction current signal.

Normal clamping status



When the mold moves

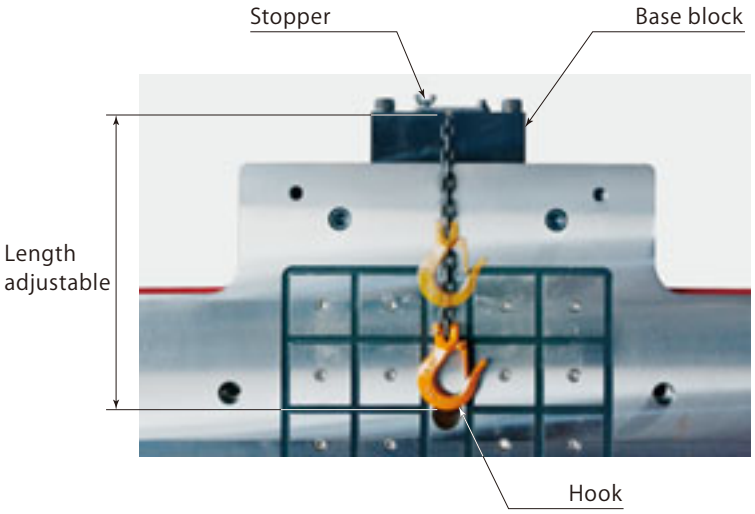


Clamp force calculation

The clamp force of Mag clamp is determined by the contact area of magnetic core (number of magnet core) with a mold. The force decrease when contact area is decreased by a cutout or holes provided to the mold. In addition to it, operating temperature over 80℃ and material of mold plate are also definite factors to have the clamp force decrease. (Refer to **page → 85** for calculation of rated clamping force.)

Mold fall protection hook (length adjustable) model MGR (optional)

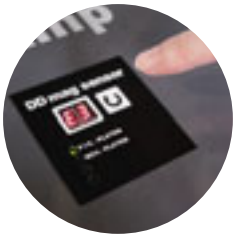
With a easily adjustable chain



Stopper

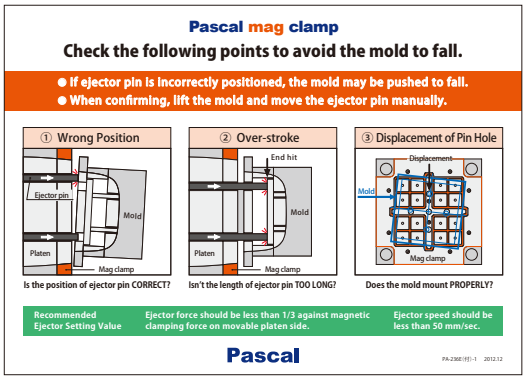
DD Mag clamp (optional)

The clamp with DD sensor which can numerically check the mold. It can detect the clamp force decrease caused by heat, mold base material and a clearance between the mold and magnet core face. Refer to **page → 34**



Check point to prevent mold fall

It is a significant factor in mold-fall to make ejector setting error. Check if stroke and position of ejector pin are correct and no misalignment with pin hole referring to caution plate. The caution plate is available for machine operators.



Caution plate

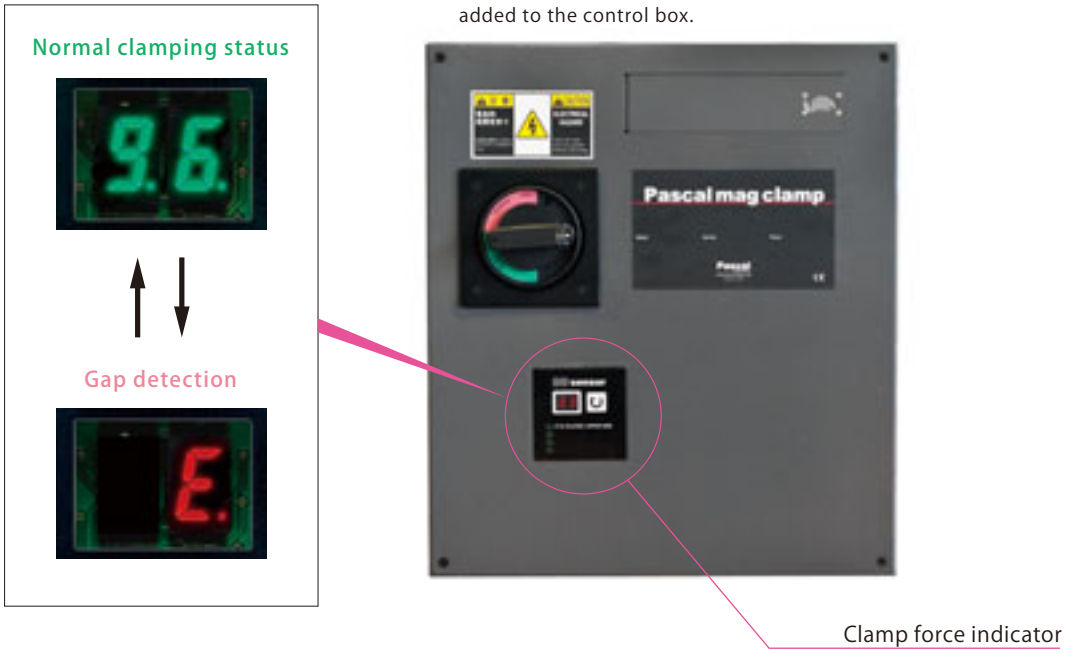
Enlarge Refer to **page → 83**

Die Detecting

Smart sensor checks the mold DD mag clamp

The clamp with DD sensor which can numerically check the mold. It can detect the clamp force decrease caused by heat, mold base material and a clearance between the mold and magnet core face.

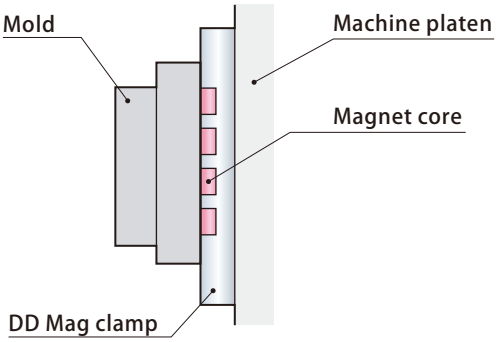
As for DD mag clamp, the status indicator is added to the control box.



＊Mold displacement detection system Refer to **page → 32**

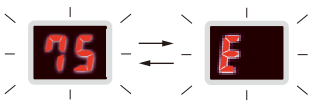
Normal clamping status

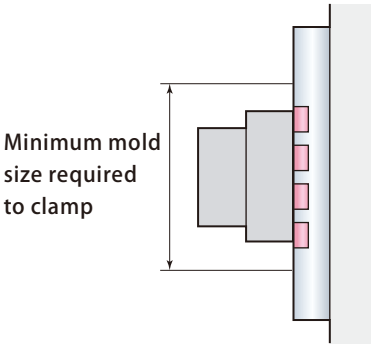
The sensor indicates AA which means the mold has adequate size, material and temperature are appropriate to clamp and there is no gap between the magnetic surface and mold.



Size detection

Detect too small mold



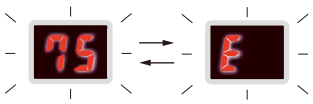


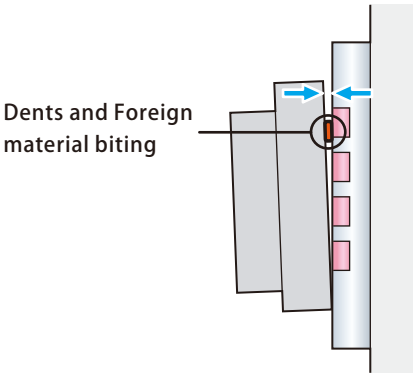
Clamp force kN	Recommended Min. mold size mm
1000	280×280
1800	330×330
3500	475×475
4500	565×565
6500	635×635
8500	710×710
10500	790×790
13000	855×855

＊Contact Pascal for details.

Gap detection

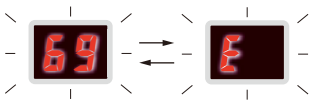
Clamp force decrease due to **the gap**

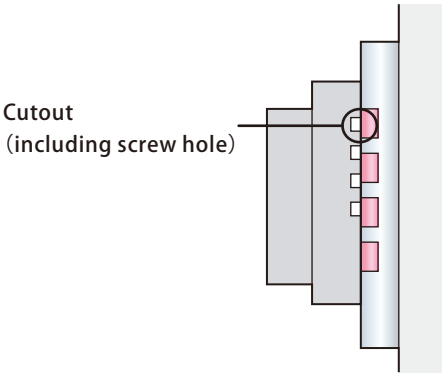




Clearance detection

Clamp force decrease due to **a clearance**

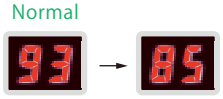


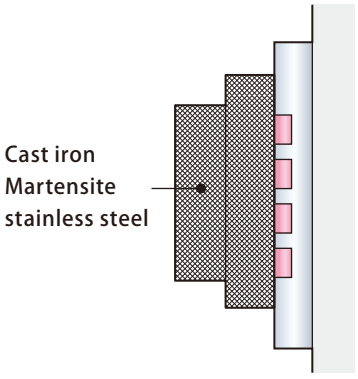


The sensor output abnormal signal when clamp force decreases more than 20% due to gap or clearance.

Material detection

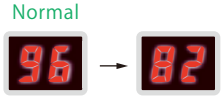
Clamp force decrease due to **the material that are not easily magnetized.**

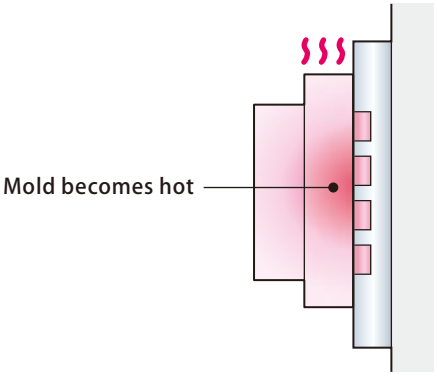




High temperature detection

Clamp force decrease due to **the mold heat-up**

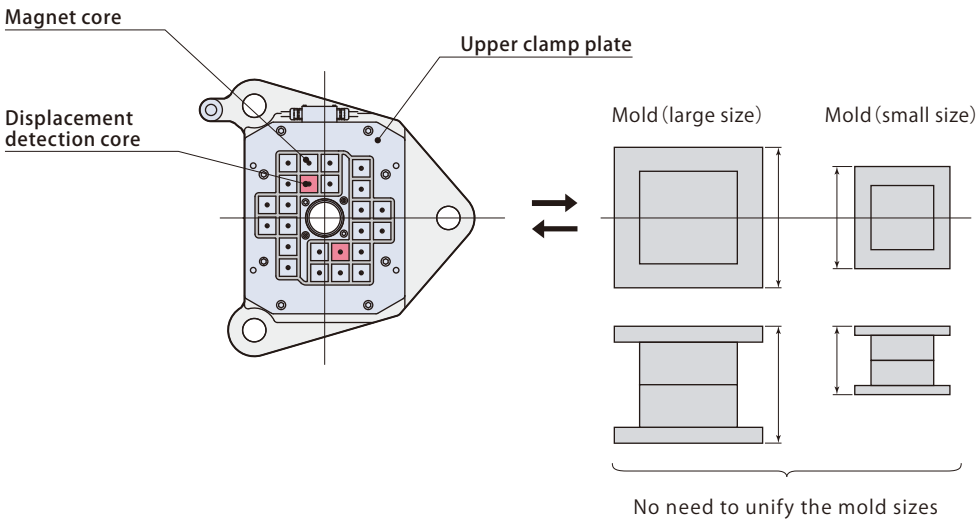




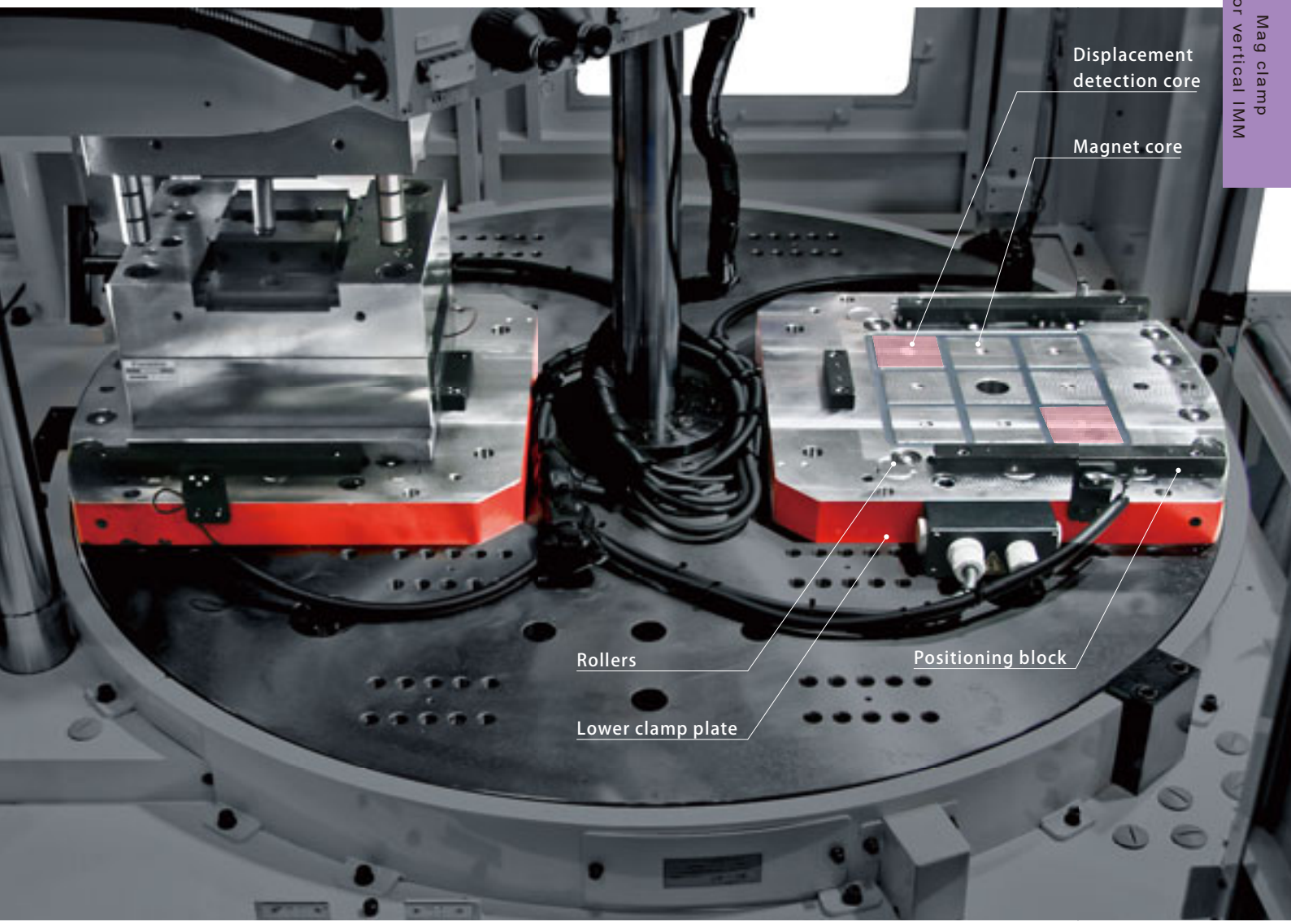
Simply type of material or mold temperature does not make the clamping force decrease lower than 80% however the value goes down due to the force decrease.

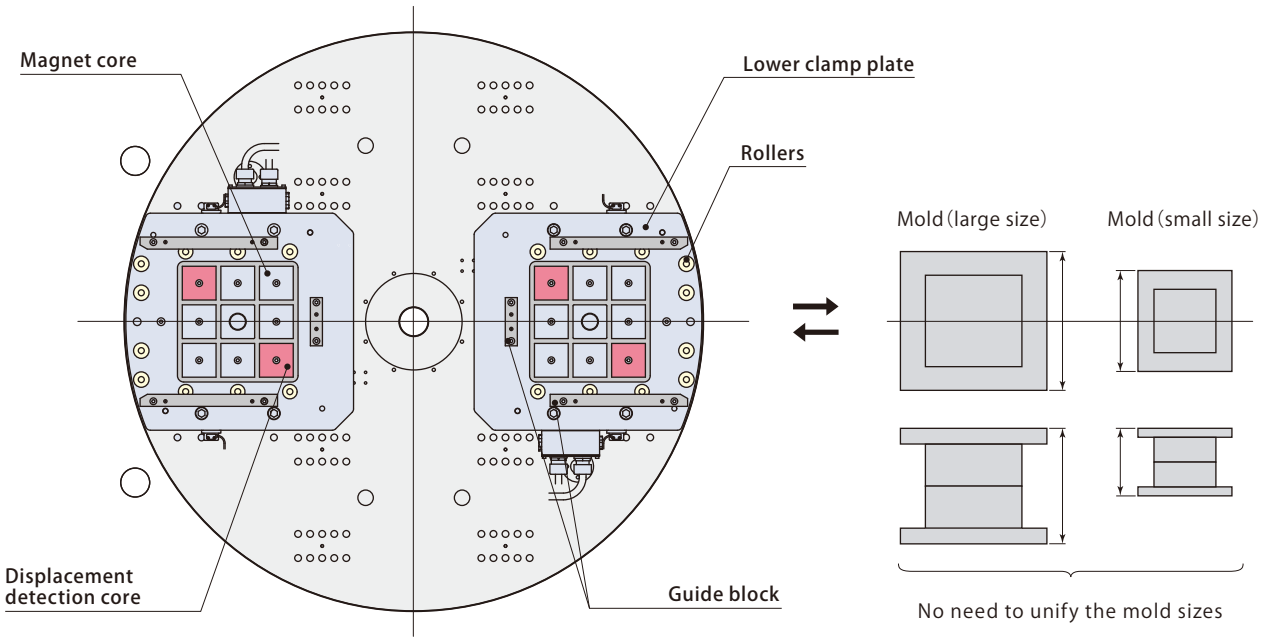
750kN (75ton) vertical IMM (fixed table) Mag clamp for upper mold

The introduction of **Mag clamp** in the vertical IMM **eliminates bolting job (temporary tightening, retightening) in the limited space of the machine** and realizes shortening the set up time considerably.



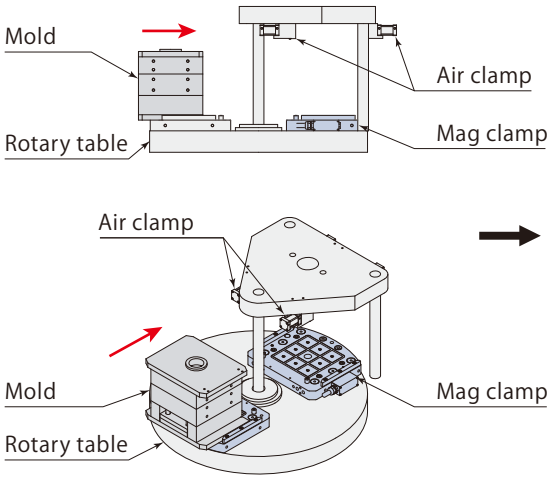
750kN (75ton) vertical IMM (rotary) Mag clamp for lower mold



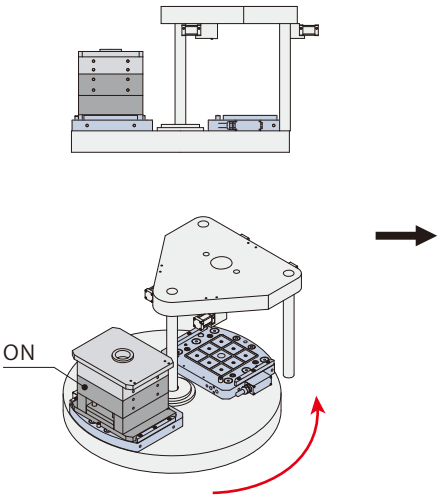


Mag clamp for lower mold mold loading procedure

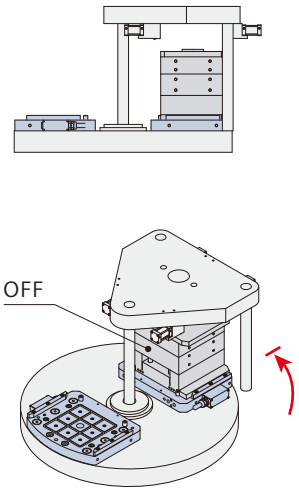
① Loading the master mold



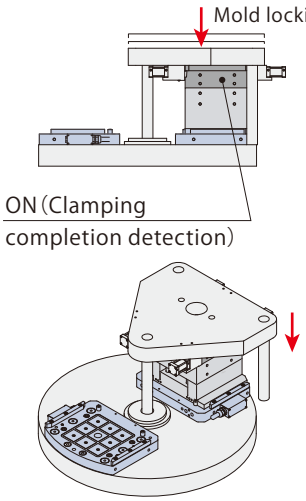
②-1 Lower Mag clamp ON
②-2 Table rotates



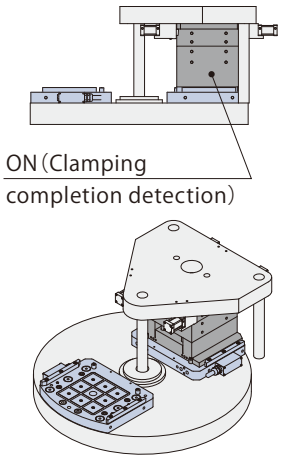
③-1 Table stops rotating
③-2 Lower Mag clamp OFF



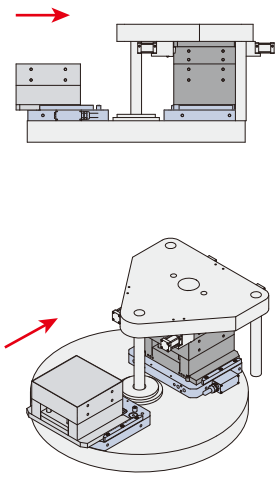
④-1 Mold clamped by platens
with Mag clamp OFF
④-2 Upper Mag clamp ON



⑤ Lower Mag clamp ON



⑥ Lower mold to be positioned
by the procedure of ② to ⑤



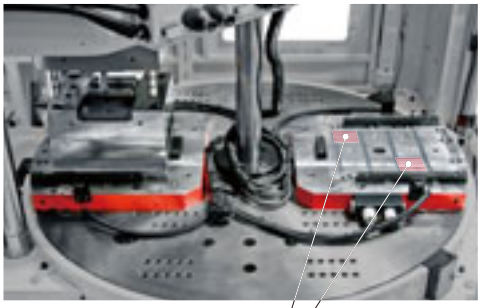
- The system can be securely operated with safety interlock.
- The above procedure is explained at **upper mold basis**.
  Contact Pascal for lower mold basis procedure.

Clamp plate

Clamp plate for upper mold (fixed table)

Displacement
detection core

Clamp plate for lower mold (rotary table)



Displacement
detection core

Operation panel for Vertical IMM

model **ESMD-C**

model **ESMD-E**

Control box

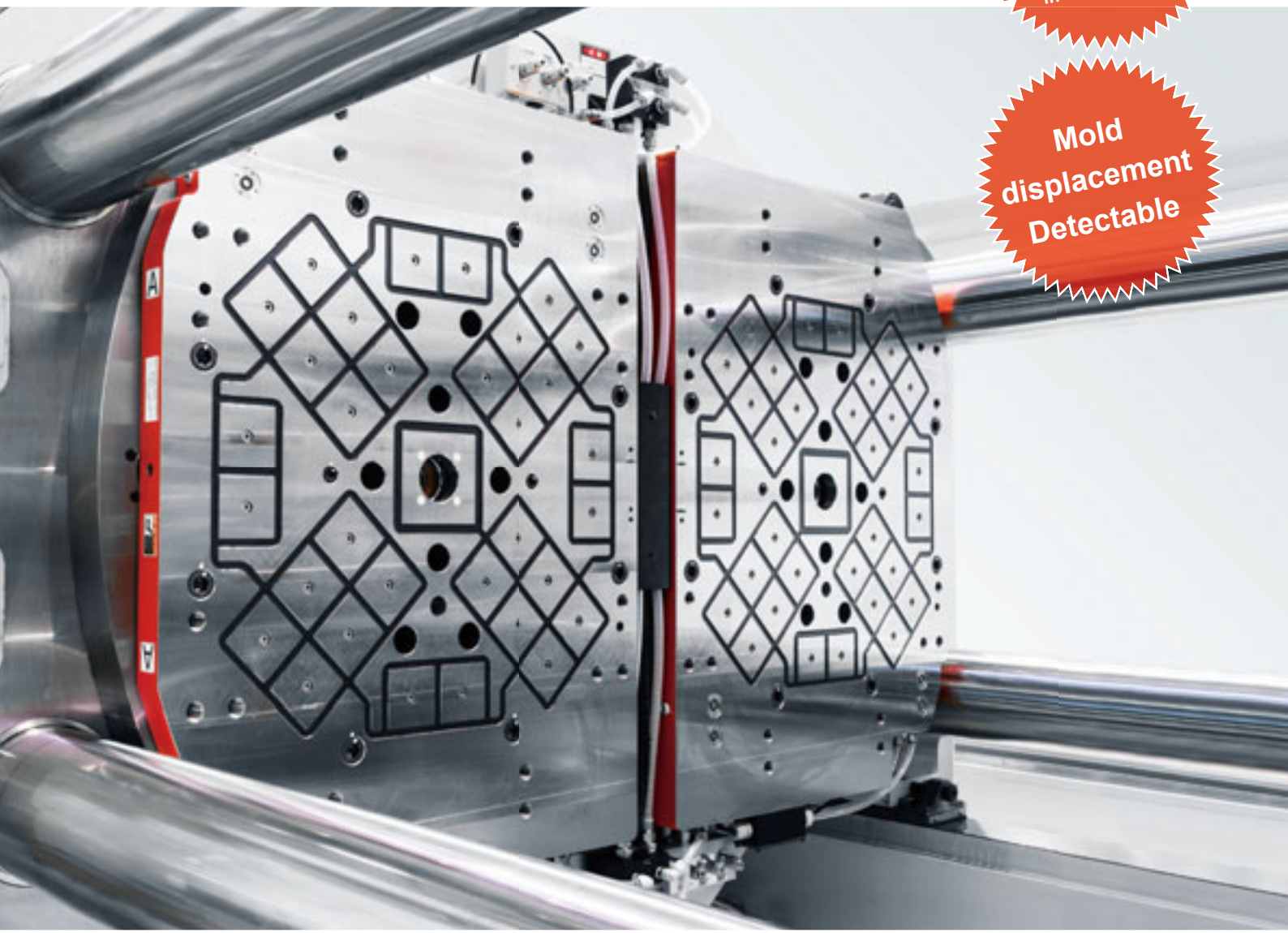
Operation panel Model

ESMD-C	ESMD-E
Upper mold : Mag clamp Lower mold : Mag clamp	Upper mold : Air clamp Lower mold : Mag clamp

Mold change with no work in the machine

Shortening the set up time to 45 min in 250 ton class

Mold displacement Detectable



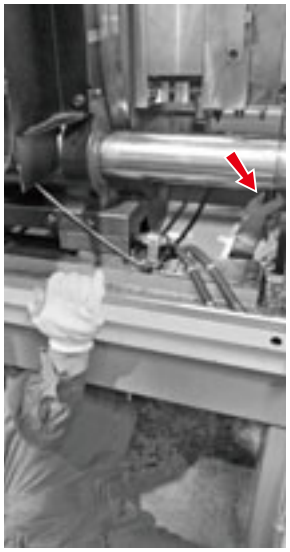
6,000kN（600ton） Two-color IMM vertical loading Mag clamp

Hand tightening method

It takes long time because an operator has to install / remove bolts many times at a narrow space in a machine.

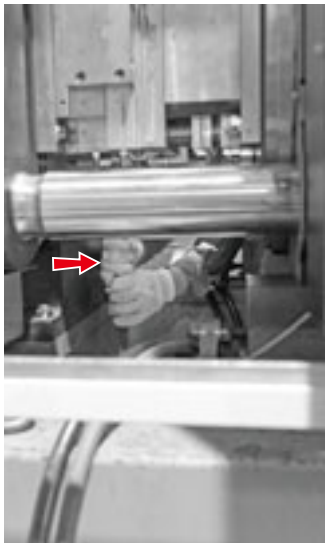
Mold changing time：60min (250 ton class)

Easy to drop tools.



Limited power exertion.

No visual



Need to move to operation / non-operation side to install / remove bolts.

Install bolts many times.

Mag clamp

Clamp instantly by magnetic force with no work in the machine.

Mold changing time：15min (250 ton class)

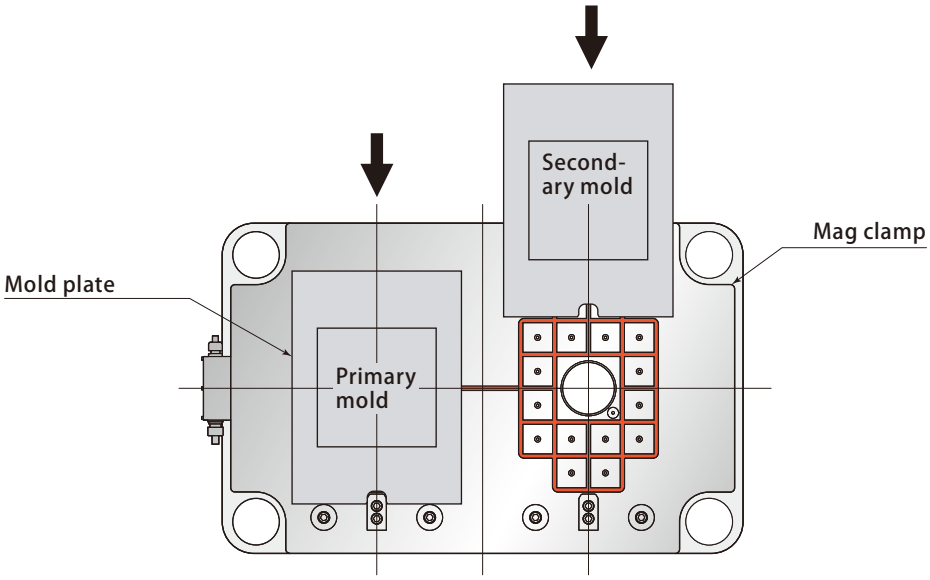
- Simply use the operation panel to clamp and unclamp the mold.

- With no work in the machine.

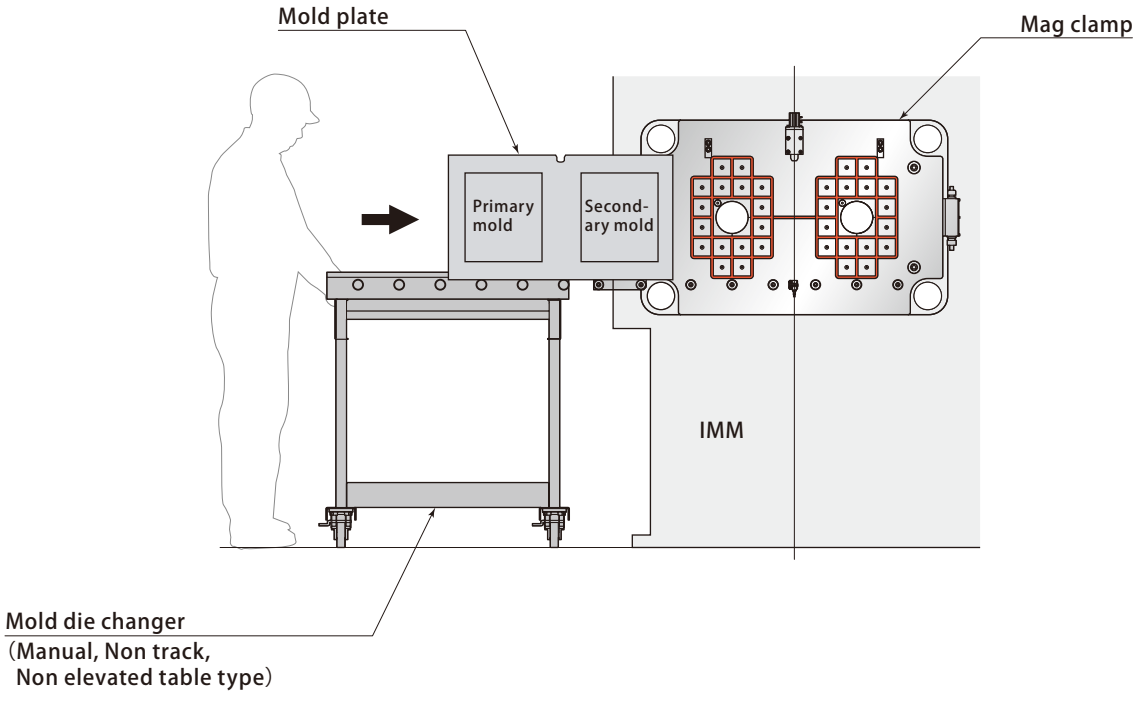
- Mold changing is done in only 15 minutes.

The moving picture of mold change operation for two-color IMM with mag clamp is being uploaded in Pascal web site.

Vertical loading

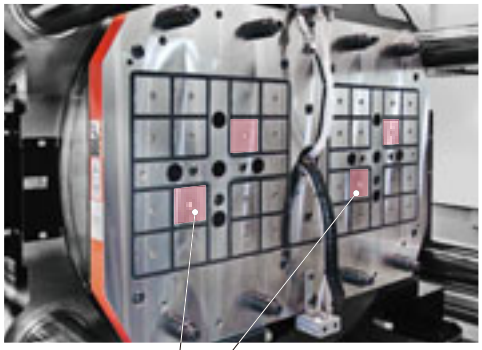


Horizontal loading



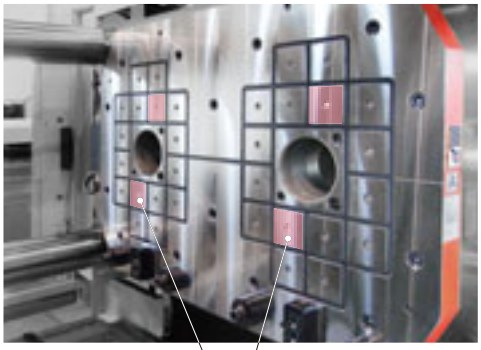
Clamp plate

Clamp plate for movable platen



Displacement
detection core

Clamp plate for fixed platen



Displacement
detection core

Operation panel for two-color IMM

model **ESMD-D**

Operation panel Model

ESMD-D
Operation panel for two-color IMM

● It enables operation of 4 plates individually.

Control box

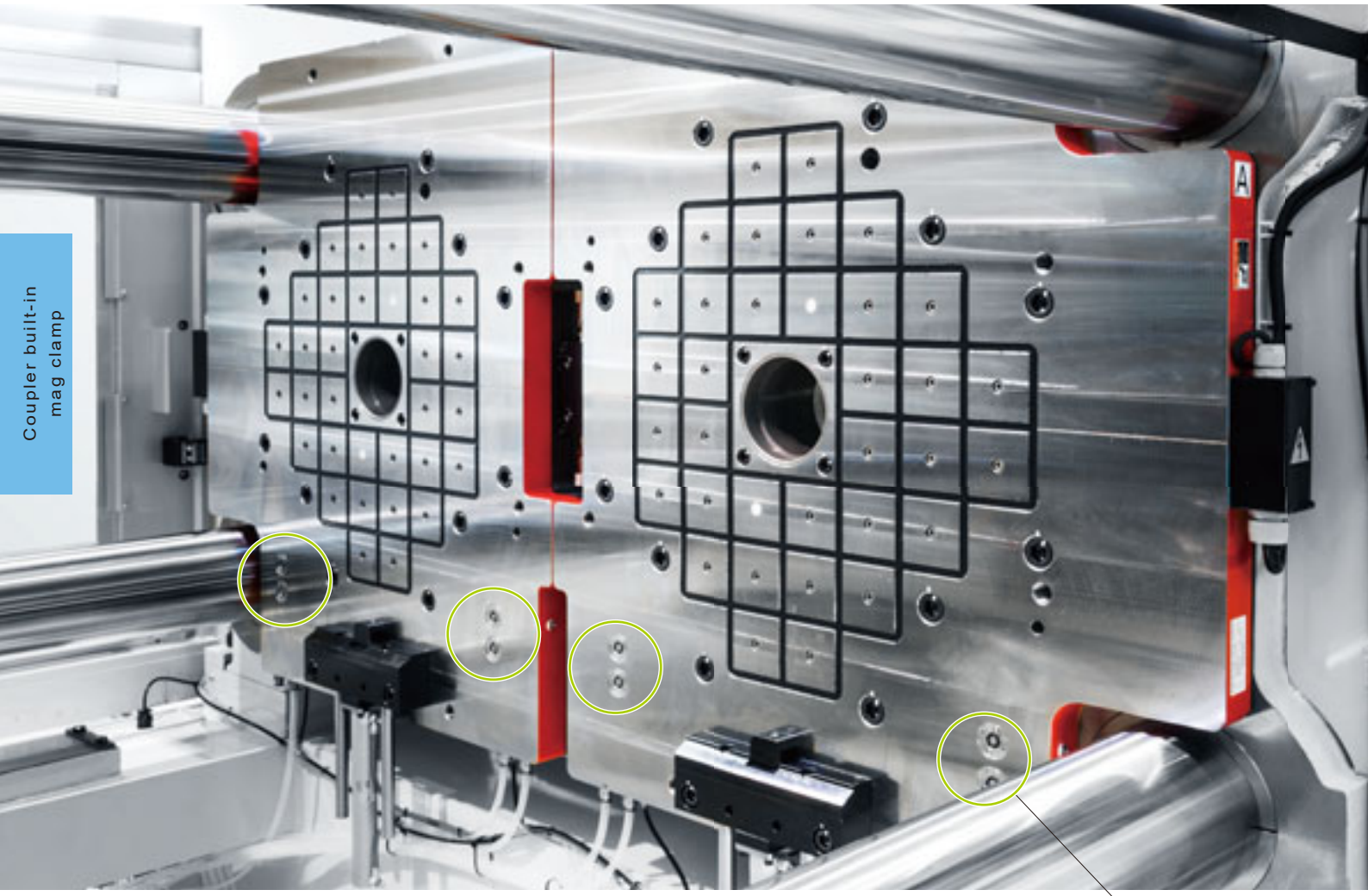
Mold mounting and coupler connecting at once

Coupler built-in mag clamp

Process reduction

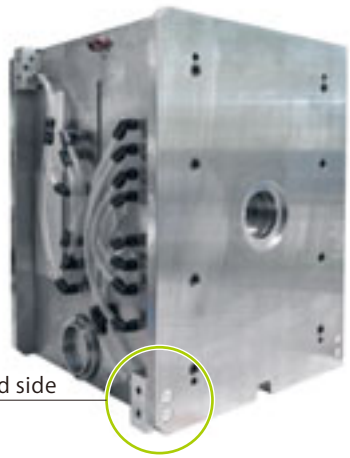
Space saving

The introduction of coupler in the magnet plate realizes the automatic clamping and coupling system at once. The mold production cost can be reduced, as the drive part of coupler and lock guide mechanism are not required. In addition, the mold modification and standardization of new design can be performed easily, as it can be introduced without any concerns about the interference between the clamp and mold or platen.



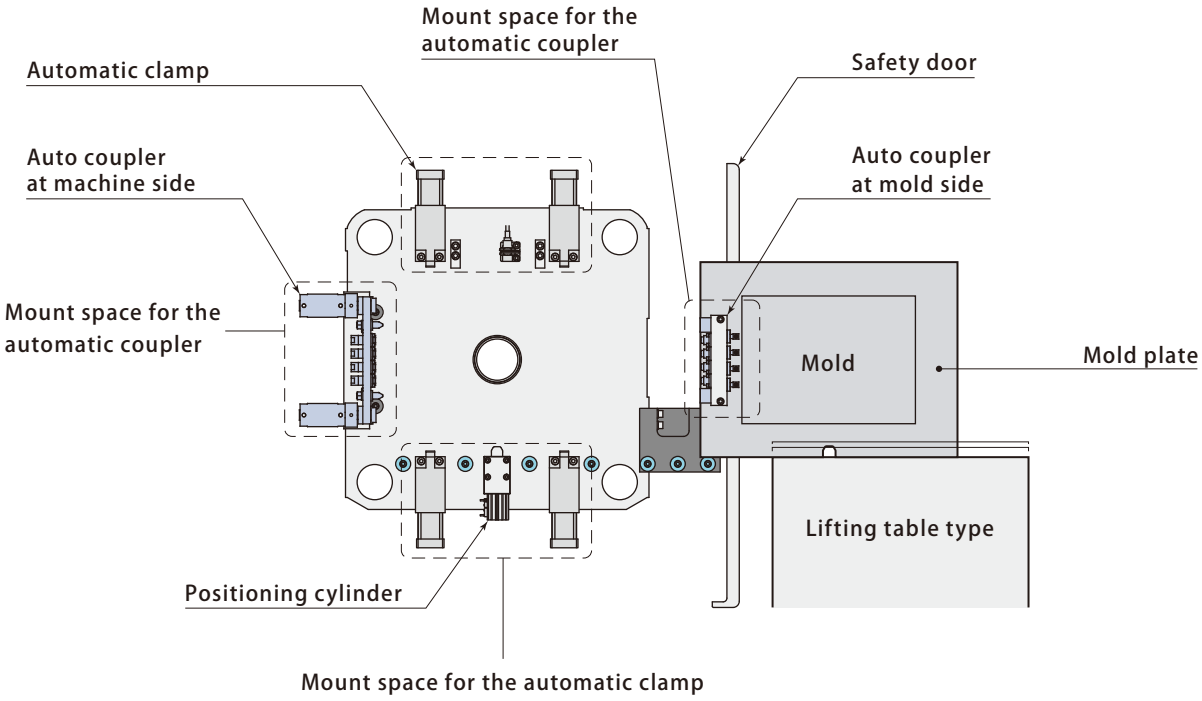
6,000kN (600ton) Two-color IMM vertical loading Coupler built-in mag clamp & Die setting system

Coupler embedded side (clamp plate side)

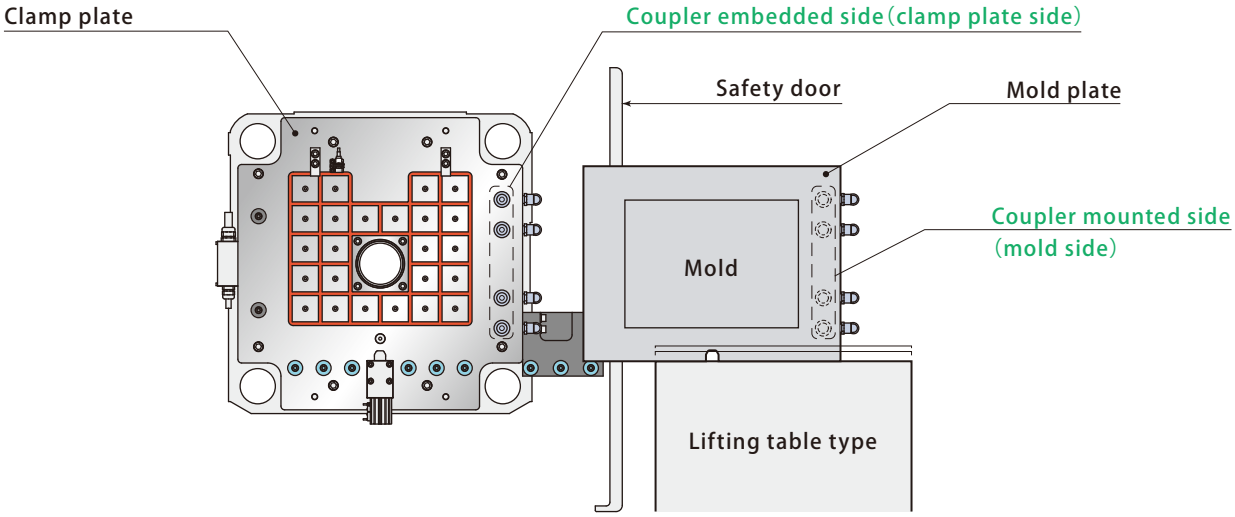


Coupler mounted side
(mold side)

In case of automatic clamping and auto coupler



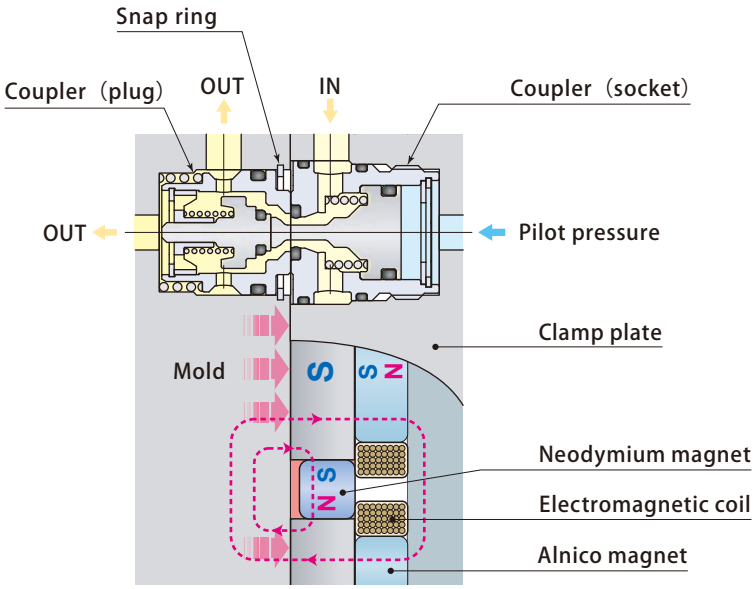
In case of coupler built in mag clamp



- The space for screw bolt and installation of clamp is eliminated by means of the mag clamp.
- Built-in coupler in the mag clamp allows to **eliminate the space for the drive part of coupler and lock guide mechanism.**

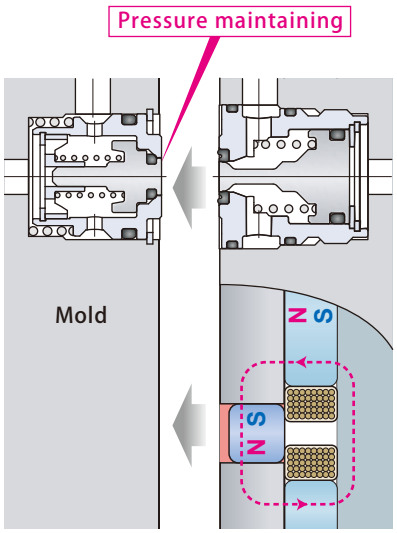
Coupler built in mag clamp Structure and Function PAT.

● At clamp (Magnetized)
Coupler at connection



1. Mold set
2. Clamp ON
3. Pilot pressure ON (Flow path open)
4. Fluid circulation starts

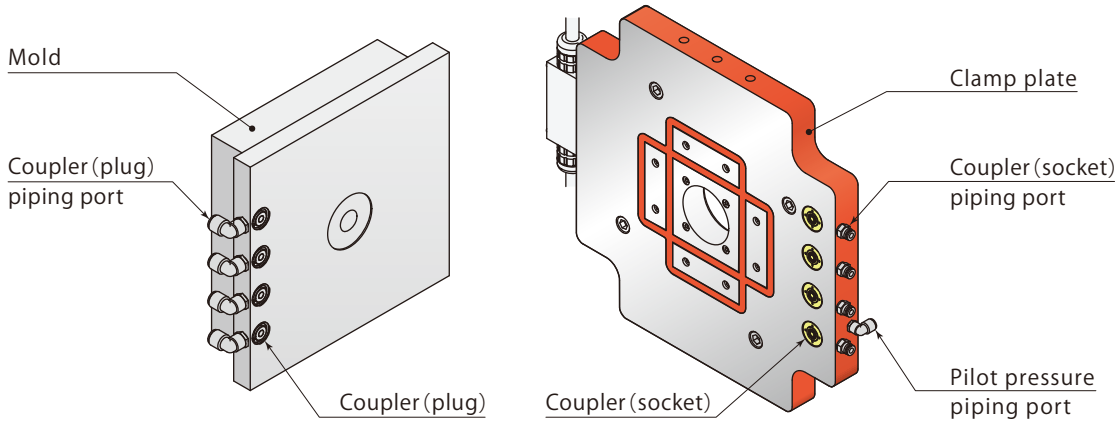
● At unclamp (Demagnetized)
Coupler at disconnection



1. Fluid circulation stops
2. Pilot pressure OFF
3. Clamp OFF
4. Remove mold

Specifications for mag plate				Standard model		Thin model
Fluid				Water, Air		Water, Air
Mounting method				Screw mounting		Mold side : Snap ring Machine side : Screw mounting
Connection port				1/4″	1/2″	1/4″
At connection	Max. working pressure		MPa	1		1
	Proof pressure		MPa	1.5		1.5
At disconnection	Max. working pressure	Mold side	MPa	1		1
		Machine side	MPa	No pressure maintaining ＊No liquid drip or spill		No pressure maintaining ＊No liquid drip or spill
Ambient temperature			℃	0 ～ 95 (No freezing or boiling)		0 ～ 95 (No freezing or boiling)
Allowable eccentricity			mm	±0.5		

Clamp plate



Operation panel

model **ESMD-A**

model **ESMD-B**

Control box

Operation panel Model

ESMD-A	ESMD-B
Vertical loading	Horizontal loading

- At the same time of clamp operation "ON" and "OFF", the coupler is connected and disconnected.

● Do not use a mold with the plate that is deformed or warped. Clamp force decreases due to the gap between the mold plate and clamp plate.

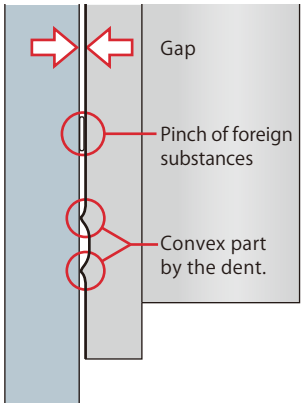
● Be sure to use mag clamp by keeping the contact surfaces of mold plate and clamp plate always clean. Water or oil on the mag clamp may not cause a decrease of clamp force however dusts or foreign substances being attracted by a magnet may create a gap between the mold plate and clamp plate.

● In case that there are some dents on the contact surfaces of mold plate and clamp plate, remove the convex part using the oilstone.

Check the below to improve the safety

● Mag clamp generates a powerful magnetism. The person who is wearing a cardiac pacemaker is strictly prohibited to approach. Projecting height of magnetic flux above the clamp plate towards forward（to mold side）is just around 20 mm. However, be sure not to bring mobile phone, magnetic card or compact disc, etc. that are susceptible to magnetism close to the clamp plate to avoid a damage.

● Do not bring any magnetic substance such as ferrous metal close to the adherence surface when mag clamp is at clamping（magnetized）. Due to the power of magnet, it may be adhered to the clamp surface, which may cause injury of fingers or hands.



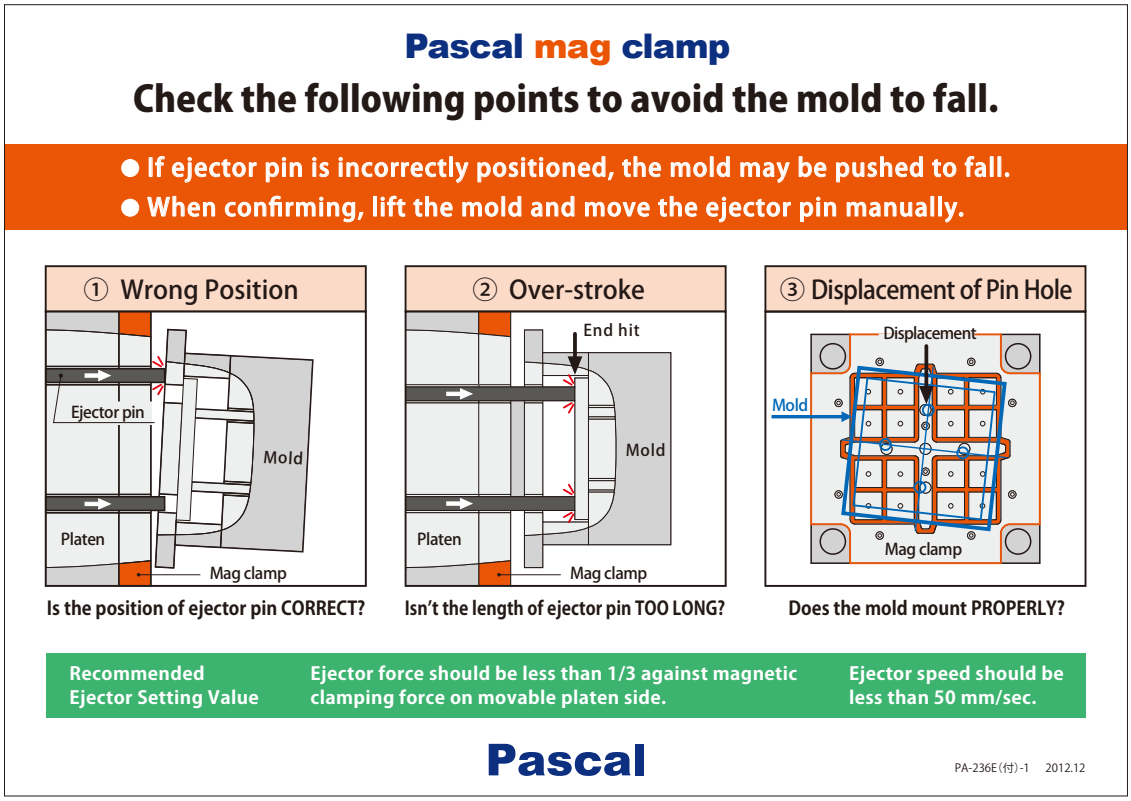
● Be sure to use an mold plate of which thickness is 25 mm or more. Although the projecting height of magnetic flux is around 20 mm, the following cautions should be considered when a mold plate is thinner than 25 mm.

① The clamping force may become decreased.
② The sensor which is easy to be influenced by magnetism has a possibility of malfunction.
③ In case a moving parts is located within 25 mm above the mold displacement detection core, it may cause a malfunction of the mold displacement detection sensor.

Setting error of the ejector

Ejector setting error is a critical cause of the mold fall. A caution plate is provided for machine operators so that the operators can check the mounted position of ejector pin, stroke and displacement of pin hole.

● Caution plate



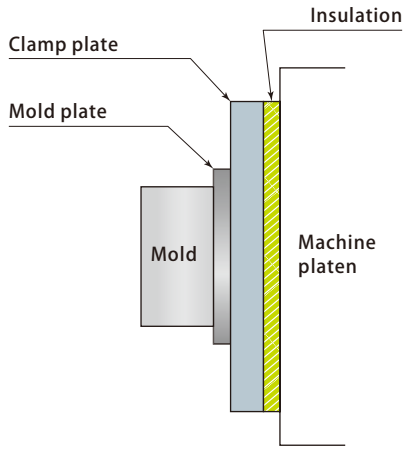
In case of using the heat insulating plate

Mount position	Between the platen and clamp plate	Between the mold and mold plate	Between the mold plate and clamp plate
Availability	○	○	Not available
Specifications of clamp plate	Heat proof type	＊ 0～ 80℃→Standard specifications 0～150℃→Heat proof type 0～180℃→Heat proof type	

＊：It indicates the temperature transmitted to the mold plate.

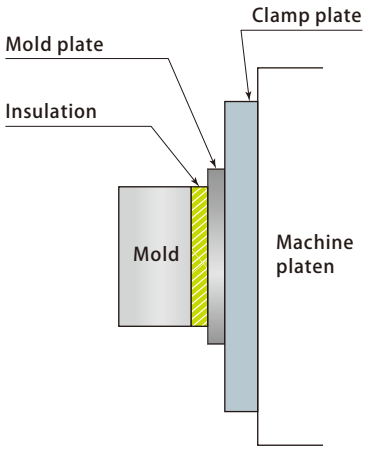
Available

Between machine platen and clamp plate



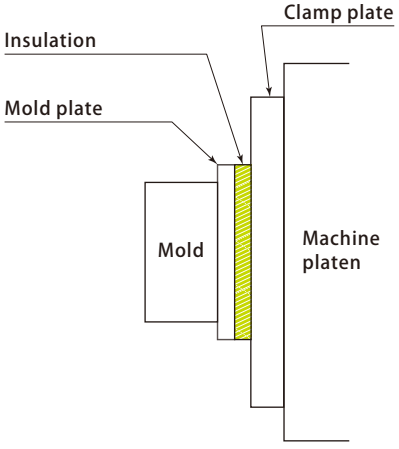
Available

Between mold and mold plate



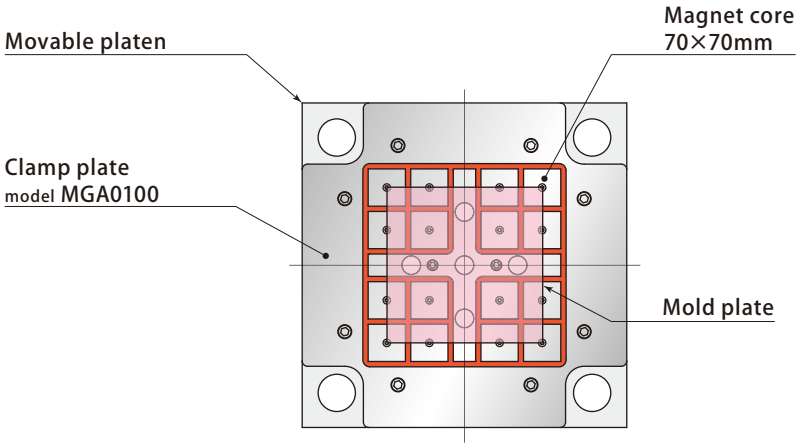
Not available

Between mold plate and clamp plate



Calculation of rated clamping force

The clamping force of Mag clamp (the adhering force of magnetic clamp) varies according to the area size (number of magnet core) where the mold plate and clamp plate contact. When loading a small mold of which mold plate does not contact all the magnet cores, the rated clamping force is obtainable by the calculation formula shown below . Refer to the following calculation example.



Example : Clamp plate model MGA0100 (movable side)

1. Magnet cores that the mold plate contacts with its entire area = 4 pcs
2. Magnet cores that the mold plate contacts with 1/2 of its area = 8 pcs
3. Magnet cores that the mold plate contacts with 1/4 of its area = 4 pcs
4. Total magnet cores that the mold plate contacts

   = 4 pcs + 8 pcs × 1/2 + 4 pcs × 1/4 = 9 pcs

5. Clamping force per magnet core = 7.35 kN/pcs
6. Rated clamping force = 7.35 kN/pcs × 9 pcs = 66.15 kN

- If there is a hole or notch at the bottom of mold plate, deduct the respective area from the total contact area (number of magnet core).
- The actual clamping force may be less than the rated force according to the conditions of mold plate.
  (Regarding to the decline of clamping force refer to **page → 86**)

Decline of clamping force

According to the conditions of mold plate for the mold, the actual clamping force may become less than the rating. Before using mag clamp, be certain to calculate and acknowledge the decline of clamping force referring to the below tables and charts. And be sure to use in the strict condition that the actual clamping force is larger than the mold opening force of injection molding machine.

(Actual clamping force) = (Rated clamping force - Reduced force) ≧ (Mold opening force of injection molding machine)

If the actual clamping force is not sufficient , replace the mold plate to a larger one to increase the contact area on the clamp plate.

Material of mold plate

Material	Clamping force
SS400 S55C S45C-H ＊	100% (rated)
S45C	95%
SK3 SUJ ＊	85%
SUS430 FC250 FCD600 ＊	80%
SKH51 SKD11	70%

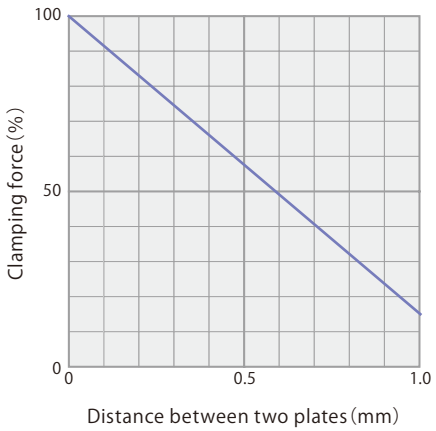
The clamping force declines according to the materials of mold plate. S45C-H, SUJ, and FCD600 tends to be hard to come off at unclamping because the residual magnetic flux on the mold affects this however it should be improved once the clearance is created between the mold plate and clamp plate.

Surface of mold plate

Surface roughness (Max. height and surface roughness Rz)	Clamping force
Rz1.6 ～ 3.8	100% (rated)
Rz7.5 ～ 15.5	approx.100%
Rz85 ～ 150	approx.90%

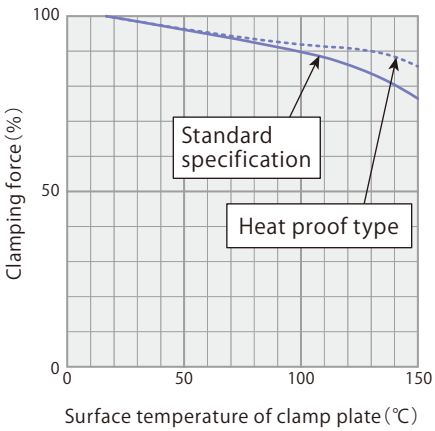
The clamping force declines according to the grade of surface roughness in contact with the mold plate and clamp plate.

Distance between two plates (mm)



A dent or deformation of the mold plate creates a distance to the clamp plate, which will decrease the clamping capacity significantly.

Temperature of mold plate



If the temperature of mold plate becomes high, the clamping force significantly decreases. Keep the mold plate temperature below 80℃ while it is clamped.